Digital Preservation – Financial Sustainability of Biological Data and Material Resources

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INTRODUCTION

• Generation of increasingly diverse and specialized data sets, some extremely large and complex

• As a result some data are put in public databases and bio-repositories

• Databases contain: genomic and metabolomic data, information about structure, function, localization, and clinical effects of mutations and mouse mutants that serve as good models for human disease

Biological databases have become an important tool in assisting scientists to retrieve information, understand and explain biological molecules and processes

• Biological knowledge is *distributed worldwide*; it is therefore difficult to:

- ensure preservation, encourage data deposition and accessibility of information
- standardize data representation and therefore data quality

DATA AND BIOLOGICAL RESOURCES

• Scientific progress depends on the ability of researchers to access and exploit data

• However, sharing of data is not always a researchers first priority

• A new concept has been established by US National Academies committee:

UPSIDE; Uniform Principle for Sharing Integral Data and Materials Expeditiously

- The responsibility of authors to share data and materials referenced in their publications

- The role of journals to impose requirements for data and material sharing

• A central role for BRCs is to champion the principles set out by UPSIDE and embrace the Open Access policy, quality of material, data integration and sustainability

DATA AND BIOLOGICAL RESOURCES

• Recently published guidelines by the Organization for Economic Co-operation and Development (OECD), highlight that adequate and reliable sources of funding are required to facilitate the sharing infrastructure and long term stability of BRCs

• Evidently, related data needs to be supported, otherwise, valuable information may be lost or transferred into a completely commercial environment

- Blockade of access to the information and/or high cost
- Loss of data and potential for technology transfer

• At the same time, as certain data types (e.g. imaging, microarray, phenotypic etc) may include costly processes for their generation, it can be potentially difficult to fulfill scientific duty and make resources available

• In order to achieve this multi-source portal (integration of databases) all contributing BRCs should be:

- validated for their data/information quality according to accepted standards
- continuously update both the level of material/data as well as incorporation of novel biological resources
- support offered by biologists/curators and informaticians

PROBLEMS ENCOUNTERED

- Although original funding comes relatively easily where the community need is clear
- Commonly databases face loss of original support after a few years in development
- A major problem for most databases – securing financial support for the bioinformaticians and curators who create and maintain them
- Lack of secure funding may frequently result in decommissioning and loss of valuable and irreplaceable data

Long-term sustainability of databases requires adequate and reliable sources of funding

How does one support a useful BRC and can ensure appropriate data/information archival and curation?

MODELS EXAMINED

- *Cost Recovery*
  establishment of an annual equitable structure for the standing expenses towards major utilities of the respective biological resource centre (provided by: government programs, non-profit organizations, pharmaceutical firms etc)

- *Fee-for service*
  a standard business model where services are unbundled and paid for separately (pay per view interface – restricted access policy)

- *Institutional Funding*
  allocated funds obtained from a particular institution towards the respective biological resource centre

- *Top Slicing publicly funded grants*
  a percentage of the allocated funds is set aside to ensure long-term accessibility of related data

THE ROLE OF INDUSTRY VS THE ROLE OF GOVERNMENT

• Both industry and government have proven to comprise the majority of funding bodies supporting BRCs

Government:

• Government funds provide a successful solution for BRCs, however this is not totally effective since benefits are not always enough to fully cover the infrastructure and business development overheads, leaving BRCs liable to service charges

Industry:

• Although industry investments are extremely essential since they provide invaluable support towards further development of resource assets, on the other hand the benefits again will not be enough to cover the infrastructure and business development which will outweigh any benefit from the original attempt

Some BRCs have attained a dual support system

A MODEL WITH POTENTIAL: ACADEMIC – COMMERCIAL PARTNERSHIP FOCUS ON CORE COMPETENCIES

- Academic laboratories:
  - are mostly sustained by institutional funding or grants
  - they develop new applications, tools and analysis systems
  - they also support the identification of communal needs and define quality standards
- Commercial organizations on the other hand:
  - financed by their own commercial activities
  - function in a collaborative manner between research and licensing
  - operate as service providers, offering standard technologies and quality systems, sales and marketing distributors

An examined model that appears to be successful towards prolonged financial sustainability of BRCs is an 'Academic-Commercial partnership'

MMdb (www.mugen-noe.org/database)

- The MUGEN Mouse database (MMdb) serves as a use-case example
- The MUGEN Mouse Database (MMdb) is a virtual online repository of murine models of immune processes and immunological disease
- MMdb is 1 out of 10 virtual repositories **contributing data to IMSR**
- Aidinis *et. al*., 2008 *Nucl. Acids Res.* **36**: D1048-D1054 (Database Issue)

D1048–D1054 *Nucleic Acids Research, 2008, Vol. 36, Database issue* *Published online 11 October 2007*
doi:10.1093/nar/gkm838

MUGEN mouse database; Animal models of human immunological diseases

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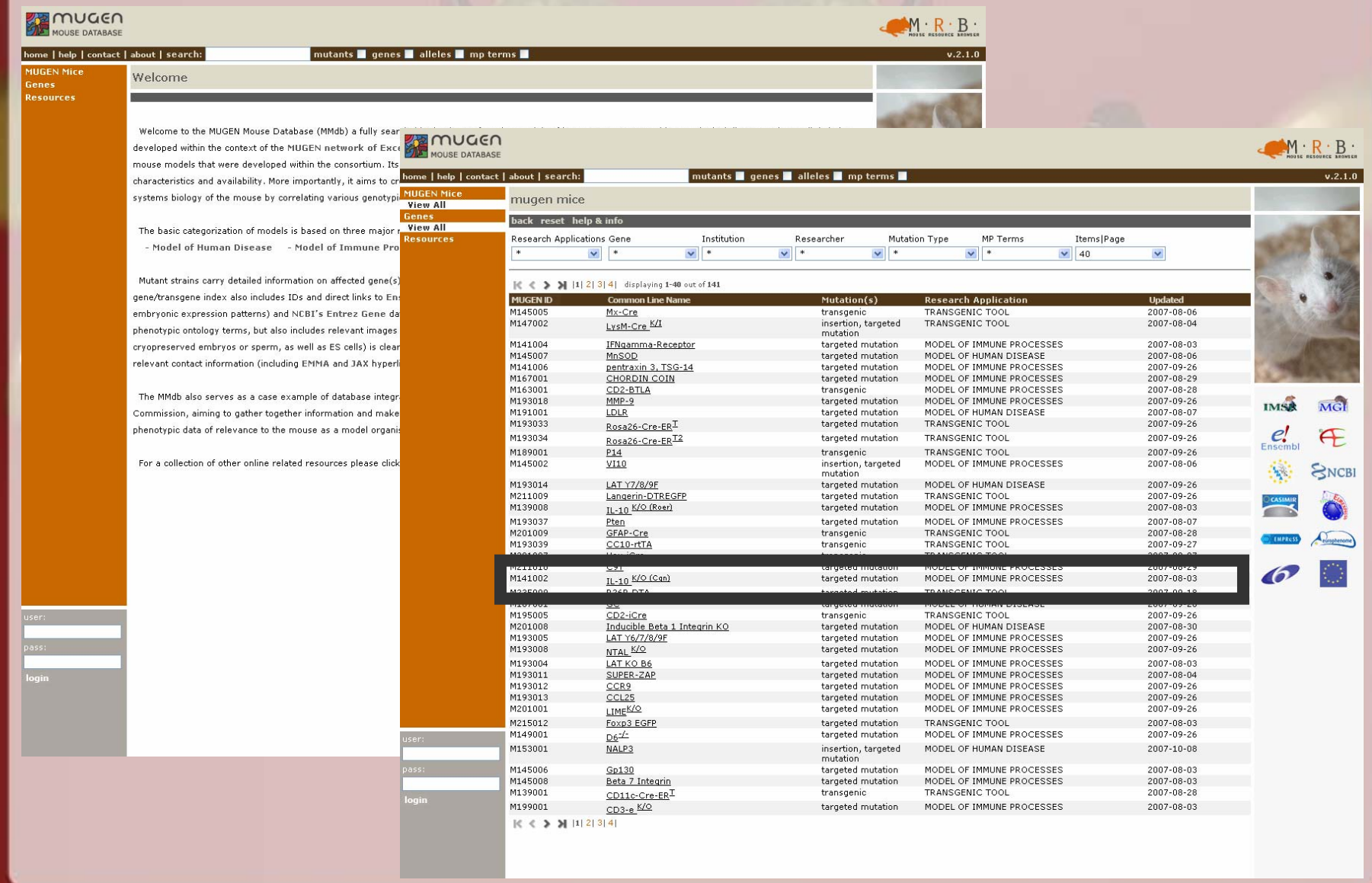
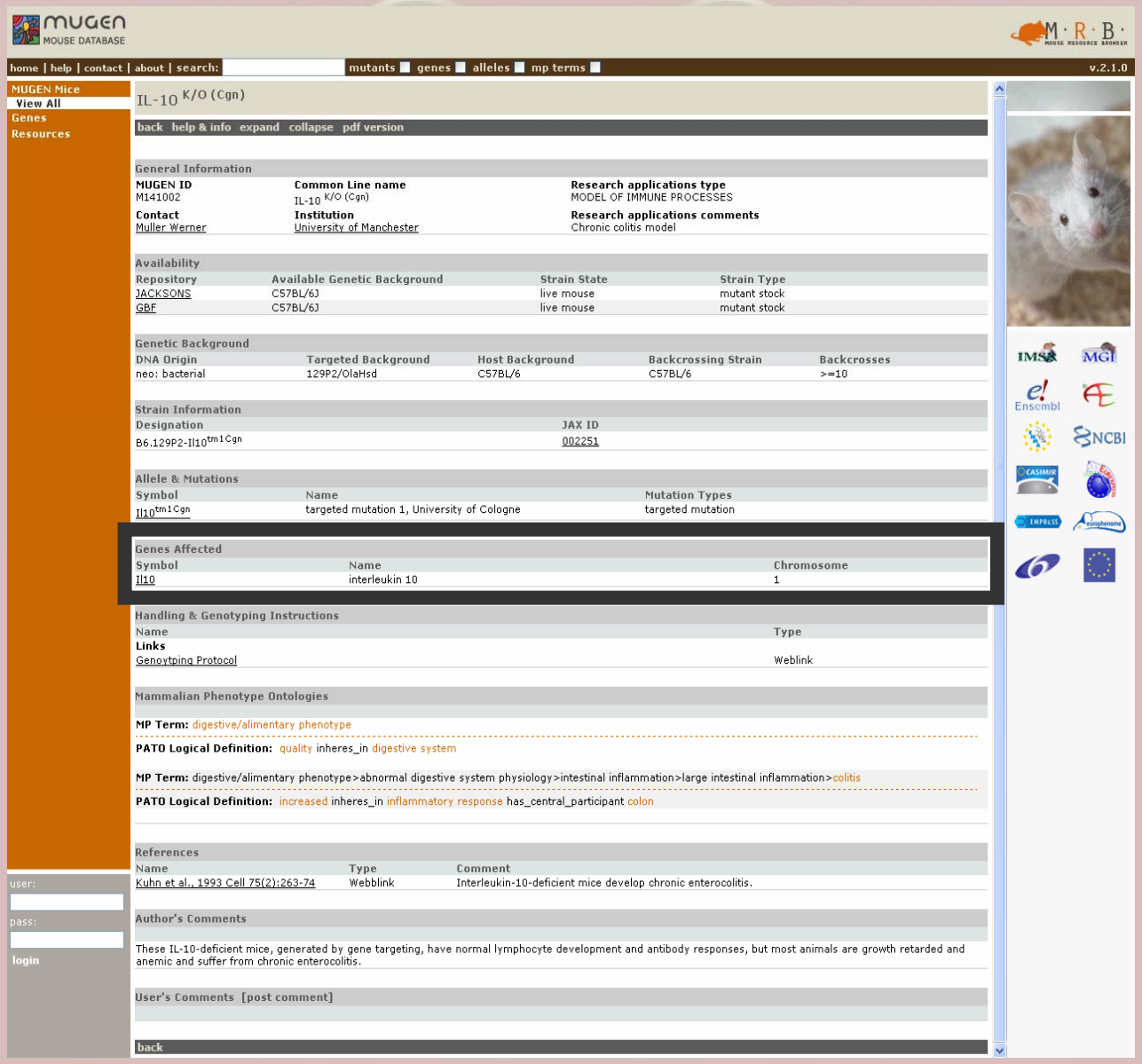
Received August 10, 2007; Revised September 24, 2007; Accepted September 25, 2007

MMdb (www.mugen-noe.org/database)



MMdb & DATABASE SUSTAINABILITY



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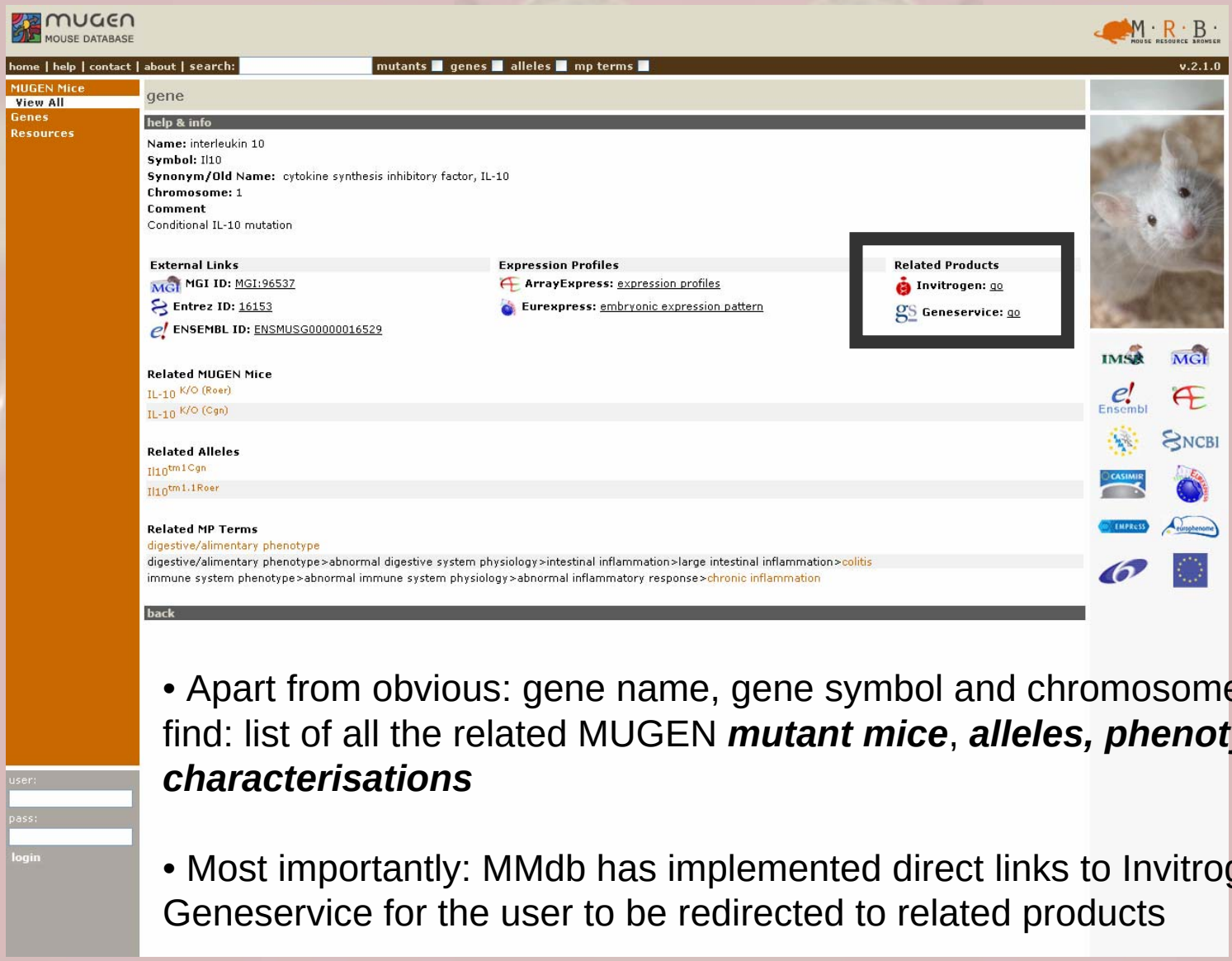

- Apart from obvious: gene name, gene symbol and chromosome, one can find: list of all the related MUGEN ***mutant mice***, ***alleles, phenotypic characterisations***

- Most importantly: MMdb has implemented direct links to Invitrogen and Geneservice for the user to be redirected to related products

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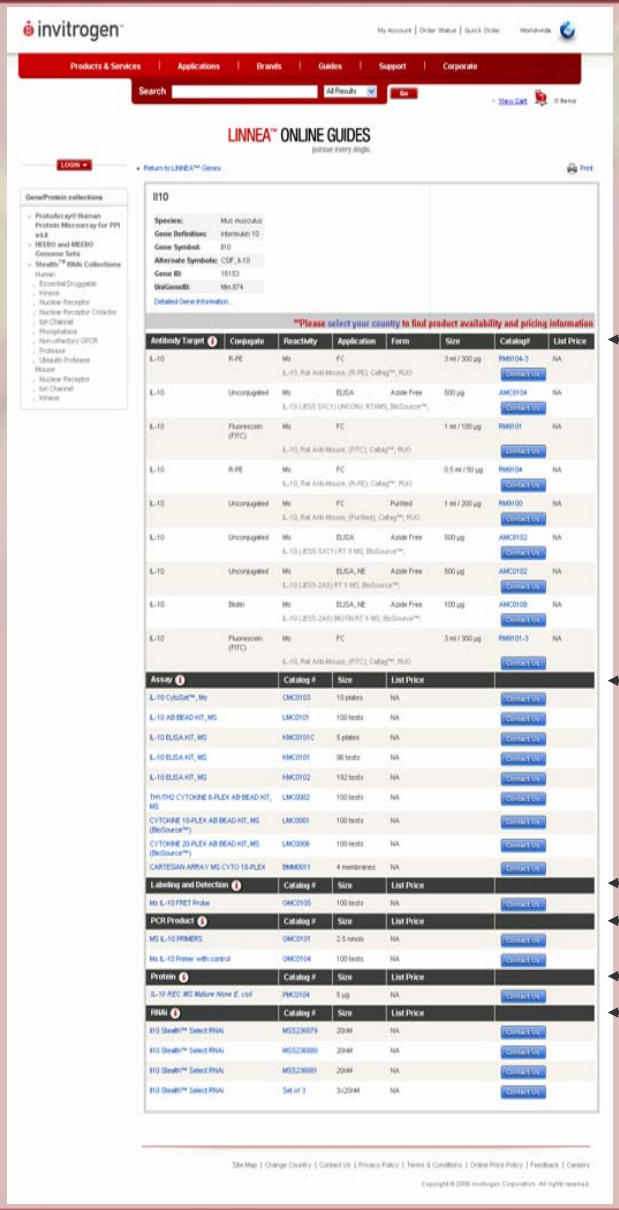

- MMdb has approached Invitrogen and other potential companies, asking them to:
  - link their individual products with the respective mouse model
  - examine the possibility that they would be interested in linking with MMdb
  - explore their willingness towards marketing/advertisement service charges which could help maintain the databases
- Although Invitrogen responded positively, the overall response was not very successful
- This approach although appearing with great potential in theory, in practice is harder to achieve as companies are not that willing to sponsor academic institutions
- This may be a matter of time and should companies be appropriately primed this arrangement may indeed prove to be beneficial towards prolonged financial sustainability

THE ROLE OF CONSORTIA

- The EU in support of FP5 and FP6 sponsored a number of projects generating biological experimental data
- Some of these consortia also serve as liaisons towards the European Commission, giving advice with respect to specific areas of interest and their respective needs for further development, suggesting potential future directions that the EU should pursue
- The European Commission has also supported some CA (e.g. PRIME & CASIMIR) especially to organize and bring together the individual European efforts as well as survey the scientific community needs
- This interactive relationship allows networks to lobby both national and international funders and potentially improve application practices and for funders to approach and consult with the network with regard to issues and priorities

Consortia play an intermediary role between the scientific community and the European Commission

CONCLUSION

- Data must be securely stored and freely available to the research community
- BRCs should not exist as data warehouses, but rather a cluster of activities supporting the community of academic and commercial researchers
- Long term sustainability of BRCs requires adequate and reliable sources of funding so that data is preserved and disseminated properly
- With regard to the examined business models:
  - the “full cost recovery” and “fee-for-service” models have some flaws
  - most promising are the “institutional funding” and “top slicing of public funding” models both of which provide a secure environment for the BRC
  - the academic-commercial partnership may appear to have potential should vendor corporations become involved in this collaborative effort

Prolonged financial sustainability is vital for data preservation and development of cross-querying

ACKNOWLEDGMENTS

Thank you for your attention

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CREATE

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